by the head (Fig. 2) or by the tail (Fig. 3), the result is precisely the same, it can never escape; and so tenacious is the grip with which it is held, that I have only once observed an insect get away after being caught. Otherwise I cannot conceive how, without some such arrangement, if the processes were perfectly smooth, they could retain anything so delicate even as the body of a young fish, much less would they be able to hold the larger creatures. I am the more inclined to this view because, when a fish emerges from the egg it is nothing but a transparent line of light, a substance without a substance, into which the most microscopically minute projection would enter without difficulty; and when it is borne in mind how easily the hair-like sting of the common nettle can penetrate the human cutis, taking into consideration the relative thicknesses of the two, I am satisfied that my argument, though open to contradiction, has at least the beauty of possessing some slight amount of probability.

I was hoping that before this I should have been in possession of several more facts concerning the *Utricularia* and its power of killing fish in a state of nature, but, unfortunately, at the time I was preparing for my observations I suffered from a severe attack of illness, which for this season at least has incapacitated me from carrying out my intentions; but I hope in the ensuing one to lay bare a few more facts concerning this new and novel enemy of the pisciculturist. G. E. SIMMS, JUN.

KANSAS

THE authorities that govern the individual States and Territories of America show themselves well-advised when they set to work to investigate the natural history and resources of their respective possessions in a healthy and unbiased spirit, and nothing is more calculated to give confidence in the future of the State than the knowledge that the truth, the whole truth, and nothing but the truth has been presented to all who are interested, with the indorsement of well-known scientific experts. The State of Kansas, which not many years back was so exercised and torn to pieces with internecine quarels and fillibustering forays, as to obtain the dolorous name of "bleeding Kansas," now appears before the world in very different guise—no longer bleeding, but with its wounds staunched; not restless, but peaceful, and bent on carrying out to the utmost the programme of wealth and prosperity which a careful examination of its capabilities shows us to be not only possible but assured.

The Third Biennial Report of the State Board of Agriculture is a portly volume of great value in many ways, although those points that deal with the geology and natural history will of course offer the most interest to the readers of NATURE.

From the geological sketch given by Mr. O. St. John we learn that Kansas, a parallelogram in shape, and containing no less than 80,000 square miles or 52,531,200 acres, lies wholly within the prairie region that intervenes between the Rocky Mountains and the Missouri; and although, to the ordinary observer, it appears to be an exceedingly flat region (Kansas City has only an elevation of 751 feet above the sea), there is, in reality, a gradual and regular ascent of the surface to the north-west corner, where the land assumes a maximum height of 4000 feet. What configurative irregularities there are, are principally due to erosion, as there is a remarkable absence of any geological displacement sufficient to produce mountainous folds, and thus give origin to local drainage systems. The most salient features of the landscape are bluffs (seldom above 500 feet in altitude), though in the larger valleys they are sometimes precipitous and intersected by ravines. The prevailing characteristic, however, is that of grassy uplands in billowy stretches, the drainage being provided for by numberless narrow channels called "draws." The general drainage system is easterly, and pretty well divided between the Missouri and Arkansas basins. The northernmost half of the State is watered and drained by the Kansas River, with its tributaries, the Delaware or Grasshopper, Blue, Solomon, Republican, and Saline on the north, and the Smoky Hill on the south; and these, with a small area drained by the head waters of the Osage River, all form part of the Missouri system. The basin of the Arkansas is met with a little to the south of the Smoky Hill, the river itself having a general south-east course into the Indian territory. The volume of the Arkansas from its distant source in the Rocky Mountains far exceeds that of the Kansas, though its valley is very little deeper, nor has it such important tributaries as the latter river. About the centre of the State, the Arkansas makes a considerable bend, receiving previously the Walnut and Pawnee Rivers, while east of the bend are the upper valleys of the Neosho, Verdigris, White-water, Little Arkansas, and Cimarron, though, as a matter of fact, nearly all these streams effect their junction with the Arkansas outside Kansas, and in the Indian Territory. The Neosho is locally famous for its valuable water power and its rich agricultural valley, and the Cimarron for its deeply eroded bed and the variegated sculptured strata of its cañon walls. The two typical rivers of Kansas State are therefore the Kansas, its valley consisting of a wide belt of low-terraced alluvial land, of great fertility, bounded by beautiful slopes terminating in frequent rocky bluffs, and the Arkansas with its magnificent reaches of level bottom land, whose depth of soil is composed of travelled sediments brought from the mountains and plains lying to the westward. Here and there the border uplands encroach upon the valley, showing shelly limestone strata, and deep, iron-dyed sandstone ledges.

The geology of Kansas is of a simple nature, and almost entirely composed of three principal formations, the Carboniferous, Cretaceous, and Tertiary. The Palæozoic rocks, as represented by the Carboniferous, appear at the surface over an area of about one-third of the entire extent of the State, entering it from the south-east, and eventually passing beneath the Dakota sandstone, which is the line of demarcation between the Palæozoic and Mesozoic series. After the disappearance of the Carboniferous rocks underneath this sandstone, they are not seen again until the Rocky Mountains, where their upraised edges have been bared by denudation at the foot of the ranges. The lowest member of the Carboniferous (Lower), as seen in Kansas, is the Keokuk limestone, which occupies a small area of about forty square miles in the extreme south-east corner, and consists of bluish-gray siliceous limestone, interbedded with cherty layers above, and often associated with brecciated siliceous matter. Limited as the Keokuk area is, it is of exceeding value to the State, for it includes the ore district of lead and zinc, and has already brought a considerable population to the newly-founded towns of Empire and Galena, on the banks of the Short Creek, a tributary of the Arkansas. Not only has a busy mining district been here established, but, owing to the excellence and accessibility of the Cherokee Coal-measures, a little to the west, the ores are enabled to be speedily and cheaply reduced at the furnaces of Weir and Pittsburgh, a few miles to the north. Galena, the ordinary sulphuret of lead, furnishes almost all the ore of that metal, together with its derivatives, cerussite or carbonate of lead (the "dry bone" of the miners), and pyromorphite or phosphate of lead. As is usually the case, the lead carries a small percentage of silver, from one to one and a half ounces to the ton of ore. The zinc ores consist of the common blende or sulphuret, "black jack," calamine (hydrous silicate), smithsonite (carbonate), and zinc bloom, many of the ores being of great beauty, from their amber and garnet tints. Associated with the ores are chalcopyrite or copper pyrites, green carbonate of copper, bisulphuret of iron or mundic, calcite or "glass-tiff," dolomite, quartz, and bitumen. The base rocks of the district consist of a deposit of limestone 100 feet in thickness, charged with characteristic Keokuk fossils, which, however, are much comminuted and splintered, and bear evidence of the pressure and tension to which the strata have been subjected. The Kansas ores are similar in almost all parts to those of the Missouri district, and it is considered quite possible that time will reveal the existence of other ore-bearing strata.

The large area of Upper Carboniferous series may be roughly divided into Upper and Lower Coal-measures, the latter occupying between 4000 or 5000 square miles, and passing, in the west, conformably beneath the Upper Measures. The series is largely made up of shales and sandstones, with occasional thin beds of limestone and iron ores, but its chief economic value consists in possessing workable beds of coal. These are mostly distributed in the lower 400 feet of strata, and are somewhat irregular and variable in thickness. Some of the coals indeed are found in little isolated basins or pockets, filling trough-like depressions surrounded by ledges of the older formation ; but as a rule, the thinner coal-beds are remarkable for their persistence over a large extent of ground. The Cherokee coals are of a very superior quality, and they (together with most of the Kansas lower beds) contain less sulphur than the coals of either Illinois or Iowa. Naturally there is a great demand for coking purposes and local consumption, while pretty heavy shipments are made to the towns and cities on the Missouri River. These Lower Coal-measures also contain excellent building-stone and hydraulic limestone, which is extensively utilised for making cement. The general inclination of the strata is north of west, with a dip that seldom exceeds 10°. The estimate of the Lower Coals, from an aggregate thickness of four feet, is 20,000,000,000 tons, and if the area be extended to that occupied by the overlying Upper Measures, so as to reach the Lower Coals accessible from 500 to 1000 feet, the product may be fairly estimated at double.

The Upper Coal-measures have an aggregate vertical thickness of at least 2200 feet, the exposed area extending for 24,000 square miles ; but in the character of the component strata they present a marked contrast to the Lower series, on account of the limestone ledges which form such striking features in the landscape. The lower beds are characterised by frequent and thick deposits of gray limestone, succeeded in the middle portion by darker, rusty, weathered ledges, and in the upper by light, buff-gray rock. The sandstones occur in some half-dozen well-developed horizons along the line of the Kansas valley, usually in the condition of arenaceous shales, and affording local supplies of building and flagging stones. In Osage County these have an additional interest, as being marked with casts and tracks of gigantic Batrachians. The limestone beds are somewhat deteriorated for building purposes by cherty deposits, but, on the other hand, they contain ironstone nodules of hæmatite and carbonate ores, with crystals of sulphate of lime and beds of massive gypsum, varying in thickness from five to fifteen feet. These gypsum deposits are capable of affording inexhaustible supplies, which are used most beneficially as manure for the soil. Where the cherty concretions are not met with, the limestone beds yield magnificent building-stone, the texture and colouring of which can be seen to great advantage in the State House of Topeka and many other public buildings. The Upper Coals are distinguished from the Lower by their more brittle texture and a larger percentage of ash and impurities. Though there are several valuable and persistent seams, such as the Blue Mound and Osage coals, thinness is a decided characteristic of the Upper Measures, few, if any, being above thirty inches, and the greater number not exceeding ten inches. But, although the Upper Measures are clearly of not so much economic importance as the Lower, it is quite possible to reach the Lower by tolerably deep borings through the Upper, and indeed this has been already successfully demonstrated.

The Mesozoic age in Kansas is represented solely by Cretaceous formations, which, however, occupy the largest area of any in the State, being no less than 40,000 square miles. The series is composed of three divisions, viz. the Dakota, Benton, and Niobrara, all belonging to well-recognised lower members of the Cretaceous rocks of the Upper Missouri region. The Dakota beds consist of sandstone interbedded with variegated shales, with occasional layers and pockets of impure coal. The sandstones are permeated and deeply stained with ferruginous matter, the iron being often concentrated around nuclei, forming singularly-shaped concretions. The proximity to the ancient land area is denoted by the rather extensive fossil flora usually found in these concretions, but the fauna is more limited in variety, comprising, so far, a few fishes, a large Saurian, and several species of Mollusks. The sandstones vary lithologically, but are usually compact and often intensely hard, forming highland ridges marked by rugged and picturesque features. Less is known of the Benton beds than of the other members of the series. They consist of argillaceous and calcareous shales, with thin layers of limestone, overlaid by dark-coloured shales, but good exposures of these rocks are rarely found. They have, however, yielded to the palæontologist several Saurians, while the limestones are frequently charged with fine ammonites, the shells of *Inoceramus*, the gigantic *Haploscapha*, and myriads of the little *Ostrea congesta*. The Niobrara beds are the most important of the Kansas Cretaceous formations, and offer much better-marked horizons. The lower portion shows alternations of fragmentary limestone and shales, which above pass into shelly limestone, and, in some localities, into chalky limestone. All these layers are charged with a wonderfully numerous and varied Vertebrate fauna, allied to forms which are common in the Colorado shales of the Rocky Mountain region, and consist of remains of Teliosts or common bony fishes, sharks, Saurians, and an extraordinary species of bird, whose jaws are armed with teeth. The mineralogist will also be interested in these beds, as furnishing beautiful examples of selenite crystal. From a landscape point of view, also, the Niobrara beds are instructive, as they are frequently intersected by miniature cañon labyrinths, and exhibit varieties of monumental forms detached by the erosion of the valleys, some of these, composed of a coping of limestone and a shaft of chalk and compact shale, rising from 20 to 70 feet in height. In an economic sense the Cretaceous series is of considerable value. The Dakota deposits contain three beds of lignite, the Benton shales yield quantities of septaria, used for making the finer qualities of cement, together with excellent chalk applicable for whiting, while the Niobrara beds furnish vast supplies of pure lime. All the divisions yield excellent building-stone, and throughout the formation a productive supply of salt occurs, from the brines of which there is already a brisk annual trade of 35,000 bushels.

The most recent formation of Kansas is principally in the north-west of the State, where there is a Kainozoic area of Pliocene beds of about 11,500 square miles, extending thence from Colorado and Nebraska, where a vast stretch of country is occupied by the White River formation. Its typical features are loosely-aggregated sands, more or less calcareous, forming irregular strata of brown and gray sandstone, while in some places siliceous beds occur, associated with several varieties of chalcedony, and containing fragments of the tusks of a very large mammal. The fauna is most interesting in this respect,—beaver, rhinoceros, camel, deer, wolf, and turtle being all represented. The district is noted for its eroded mounds and columns, the most striking being the Sheridan *Buttes*, which rise in perfect isolation to 200 feet above the Smoky Hill River, the summit capped by a heavy ledge of light gray, very hard siliceous rock, which has been weathered into miniature grottoes in the higher of the two cones. Underlying the Pliocene beds is a thick deposit of chocolate-coloured shales, with concretionary masses of limestone and septaria, and splendid crystals of selenite. Among Post-Tertiary deposits, examples are to be found, in the eastern portion of the State, of the Drift and Loess, the latter being strikingly displayed in the bluffs that bound the Missouri River valley for so many hundreds of miles in the States of Iowa, Nebraska, Kansas, and Missouri.

An appendix to the foregoing geological account is added on the botany of Kansas, by Prof. J. H. Carruth, but it is very short, for the reason that the catalogue of Kansas plants was made in 1880, and the present notice is merely to record certain additions (about 36) to the 1430 plants already found, of which only 30 are non-flowering. Considering that New York, with its varied surface and qualities of soil, can only show 1450, it is most interesting to note that Kansas, with its comparatively uniform soil and surface, produces almost as many.

A valuable report on the Kansas entomology is given by Prof. Popenoe, who furnishes detailed accounts of certain insects that commit ravages upon the crops. Among these figure prominently the large poplar-borer (*Plectrodera scalator*), which is a great tree-destroyer, making innumerable holes in the trunks of the willow and cottonwood. A singular fact is recorded of the buck moth (*Hemileuca maia*), viz. that as a larva it possesses a peculiar means of defence. The coarse, black prickles with which the body is covered are very sharp, and when they penetrate the skin on the back of the hand or elsewhere, they produce little pustules and a sharp nettle-like sting, though not of any duration. The red-lined tree-bug (*Lygæus trivittatus*) is a relative of the well-known squash-bug, and does infinite damage to the elder-tree, besides evincing a strong partiality for the interiors of greenhouses, where it destroys geraniums, ipomeas, abutilons, and other horticulturists' pets. The chequered snout-beetle (*Aramigus tesselatus*) has usually been known to infest leguminous plants, and more especially the silver-leafed prairie pea (*Psoralia argophylla*). Latterly, however, it has been noticed to pay great attention to the sweet potato, and has inflicted considerable havoc on that crop. The harlequin cabbage-bug (*Strachia histrionica*) attacks the Cruciferæ, and especially the wild cress (*Lepidium*), mustard, radish, turnip, and cabbage. The abundant little beetle known as the corn-root worm (*Diabrotica longicornis*) has only recently been discovered to be a corn-pest of the first magnitude, attacking the roots about the period of "earing," and causing a partial development of the grains.

Though only the points that bear most on Kansas natural history have been noticed here, it should be stated that the volume gives an exhaustive account of the resources and statistics, commercial, social, and educational, of each county in the State, and that the whole is illustrated by an admirable series of maps.

G. PHILLIPS BEVAN

NOTES

THE death is announced of Ferdinand von Hochstetter, the German mineralogist and geologist, whose name is intimately associated with the geology of New Zealand. Hochstetter was born in Würtemberg in 1829. In 1857 he joined the *Novara* expedition, but quitted it at New Zealand, the geology of which he spent a considerable time in investigating. In 1860 he was appointed Professor of Mineralogy and Geology in the Polytechnic Institute of Vienna, and in 1867 was made President of the Vienna Geographical Society. Among his published works are: the "Topographico-Geological Atlas of New Zealand"; "Geology of New Zealand"; "Palæontology of New Zealand"; "The Geology of the *Novara* Expedition"; "Rotomahana and the Boiling Springs of New Zealand"; besides works on the geology of Eastern Turkey, the Ural, and various popular publications.

IN the name of fair criticism, in the interests of true science, and in defence of a man who has grown gray in the public service, and who has recently retired full of years and honour to the rest he so well merited, a protest should be made against the language in which the *Mining Journal* last week permits itself to speak of Mr. Robert Hunt, F.R.S. We do not choose to discuss the relative merits of the new "Mineral Statistics" and those with which his name is so familiarly conjoined. But by all who know how entirely Mr. Hunt's heart and soul were in his work at the Mining Record Office and how unwearied were his labours on its behalf, an emphatic and indignant repudiation will be made of the charge brought by the anonymous critic that he failed to do his duty and set a bad example to his subordinates. Mr. Hunt needs no defence from such an odious charge. We cannot but express our regret that it should have been made in the columns of a respectable journal and under cover of an anonymous review.

WE are still a long way from admitting that a little elementary physiological knowledge is a desirable element in general education. But it is not often that such a glaring example of the want of it is met with as is revealed by the following extract from a despatch of the Acting Consul at Panama recently presented to Parliament. It would not be easy to find its parallel among the worst answers in the May examinations of the Science and Art Department:—"Many essays have been written on this appalling scourge [yellow fever], its origin, and its existence, but nothing seems more probable, more reasonable to me, than comparing the human blood to milk, which under influence of temperature and circumstances becomes curdled. In the like manner, the human blood, the human frame and organism, under certain abnormal, adverse, and unfavourable circumstances, become curdled, and enter into a state of dissolution, more or less rapid; the blood, owing to its component parts, coagulates, being impregnated with bile, phosphate, and albumen, through the stagnation of the liver and kidneys. This my theory is the one I certainly believe in. *Savants* assert that the disease is generated by spores of the marine mushroom (*Mycenium fungi maris*), which multiply in thousands per minute. Others profess it to be animalculæ termed 'microbes.'"

MR. JOSEPH THOMSON, the leader of the Geographical Society's expedition to East Africa, has arrived in this country. Mr. Thomson has suffered greatly from the hardships which he had to endure, and it will be several weeks before he regains his usual vigour. Mr. Thomson's expedition has been completely successful, and he himself estimates the results as of far greater scientific importance than those of his first expedition. The region traversed by him, from Mombassa to the north of Victoria Nyanza, is entirely volcanic, and his observations therein will be of great geological interest. There is still one volcano, west of Kilimanjaro, which shows signs of activity. Mount Kenia, though covered with trees, stands amidst a desert. The Masai, the leading people of the region explored, are of special interest. Their features, customs, dwellings, religion, language, differ markedly from those of any other African people with whom Mr. Thomson is acquainted. Fortunately besides his copious notes he has brought home many photographs, so that his forthcoming narrative is sure to be of unusual interest and value.

THE Conference on Water Supply by the Society of Arts will be held at the Health Exhibition to-day and to-morrow. The Conference will meet each day at 11 a.m., and will sit till 1.30, then adjourn till 2, and sit again till 5. p.m. The papers and